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Nudging in Food Waste Management: Where Sustainability Meets Cost-Effectiveness

Anna de Visser-Amundson and Mirella Kleijnen

Introduction

Professional kitchens waste up to 20% of the food they purchase, much of which is avoidable waste (Boulden 2017). Chefs are generally aware of this problem and particularly of the financial impact of food waste on food costs (Perroni 2017). Yet, as a result of accepting food waste as an integral part of delivering excellent food service experiences, there is a significant gap between chefs' attitudes towards food waste and the actual behaviour in the kitchen (Pirani and Arafat 2016). While cost reduction measures, in general, are often perceived as akin to trade off in service quality

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(Rust and Huang 2012), recent research proposes that firms can in fact operate under a dual strategy of both cost-effectiveness and service quality to achieve so-called cost-effective service excellence (CESE) (Wirtz and Zeithaml 2018). Prior research shows that nudging is an effective strategy to reduce costs by triggering behavioural changes specifically targeting behaviour rather than providing information and cognitive appeals (Lehner et al. 2016; Thaler and Sunstein 2008; Vlaev et al. 2016). In that regard, nudging has the potential to break wasteful habits of kitchen employees and offers interesting opportunities for professional kitchens to reduce costs without impacting the service delivery. The objective of this chapter is to address nudging as a novel strategy in an employee context to stimulate food saving behaviours that reduce costs and facilitate the pursuit of CESE.

The current guidelines for professional kitchens predominately focus on skills training and process management (Filimonau and Delysia 2019; Heikkilä et al. 2016; Hollins 2013; Strotmann et al. 2017). This requires rational and deliberate decision-making and resource allocation which, with all best intentions, is difficult to do as habits and pressures to perform kick-in. Hebrok and Boks (2017) support this and state "educating people may not reduce food waste because knowing and valuing is not enough to change norms and practices […] linked to food waste" (p. 383). Answering the need for a new strategy, nudging is a subtler approach that often appeals to unconscious mechanisms (Thaler and Sunstein 2008). Indeed, by manipulating the behavioural context or simply changing the choice architecture, nudges can trigger people to make better choices for themselves, others and the environment in a more automatic and effortless manner.

Aligned with empirical work showing that nudging is effective across numerous disciplines and settings (Dolan et al. 2010; Lehner et al. 2016; Vlaev et al. 2016; Wilson et al. 2016), prior research also demonstrates its usefulness in consumer food waste settings. For example, a nudge in the form of a sign on the breakfast buffet welcoming hotel guests back for more servings (to avoid them heaping up food), significantly reduced food left on their plates and hence the amount of food wasted (Kallbekken and Sælen 2013). Another study shows that nudging cafeteria guests to ask for smaller portions (without decreasing the price) doubled these requests and that asking for smaller portions is driven by feelings of guilt and shame (Jagau and Vyrastekova 2017)

and social awkwardness (Parizeau et al. 2015). Supporting those results, Whitehair et al. (2013) also show that (1) prompting socially correct behaviour regarding portion size and (2) providing group feedback about the group's food waste behaviours triggered a 15% decrease in food waste at a university dining facility.

In contrast, Bernstad (2014) shows that written messages have little influence on food waste separation. In support of other research (e.g. Dolan et al. 2010; Vlaev et al. 2016), she demonstrates that convenience as in making the "right things easy" makes a significant difference, such as providing extra bins to separate the waste. Yet a meta-analysis points out that these results are highly dependent on the type of message and social influence approaches (i.e. nudges) used (Abrahamse and Steg 2013). Thus, despite convincing evidence of the overall effects of nudges as behavioural interventions, more fine-grained insights are still needed in order to successfully execute nudging strategies.

This research attempts to disentangle the effect of social norms and pre-commitment nudges on food waste reduction in a real-life setting. We do so in an underexplored employee context. Indeed, extant research on nudging is heavily biased towards the consumer perspective (e.g. Schubert 2017; Wilson et al. 2016), despite the insights offered by Abrahamse's and Steg's (2013) meta-analysis confirming that social nudge-type interventions are the most effective in an employee setting. In this chapter, we specifically show how nudges can be used strategically in managing the workforce to be more cost-efficient by saving more food from becoming waste. We thereby contribute to the scarce literature on nudging in a professional kitchen and food waste context (Lehner et al. 2016) as well as answer research calls to further explore how social influence triggers behavioural change in an employee and student setting (Abrahamse and Steg 2013). In doing so, we also demonstrate how nudging can be instrumental in operationalising a CESE strategy. In particular, by reporting empirical findings from two field studies using social norms and pre-commitment as nudges independently of each other in two different kitchens, we show how food waste can be significantly reduced while still delivering excellent service.

Cost-Effective Service Excellence

The kitchen is a highly pressured environment, where competition is fierce on all levels, from mainstream to Michelin star restaurants (Ariza-Montes et al. 2018). Chefs deal with real-time production and consumption driven by the perception that "you are only as good as your last meal" (Chiovera 2012). At the same time, consumers often demand superior experiences with a high level of customisation to specific needs. In the fear of losing business, offering abundance and variety are standard practices despite the waste and costs they might generate. Consider bread in restaurants, for example. It is unthinkable, even in the most modest restaurant, not to be offered fresh bread and preferably several varieties of it. Matching varying demand levels with such a perishable product is a difficult task and results in more than 200,000 breads being wasted every day in food service outlets in The Netherlands alone (Stuart and Jarosz 2017; Van Prooijen 2017). Such service operations (where the production and consumption occur simultaneously and at fluctuating levels of consumer demand, preferences and involvement) make it particularly difficult for restaurants to operate efficiently. Indeed, many restaurants struggle to achieve high productivity levels due to real-time production and lack of possibilities to standardise processes. This leaves many service organisations with a trade-off between costs and perceived service quality (Rust and Huang 2012) resulting in restaurants, in particular, to focus on customer satisfaction and accept lower efficiencies (thus higher costs).

Dual-Culture Strategy

It is clear that it is difficult for many service organisations to accomplish CESE. It leaves many to a dichotomy of pursuing either a (1) customer satisfaction or (2) productivity focused strategy (Wirtz and Zeithaml 2018). Porter (1985) classically argued that straddling on both of these paths would leave companies "stuck in the middle". Yet the pursuit and achievement of a dual-culture strategy—a combination of service excellence and low cost—yields higher financial returns than when only

focusing on one (Mittal et al. 2005). In addition, companies that have achieved CESE through a dual-culture strategy (e.g. Singapore Airlines) have also created a sustainable competitive advantage and are regularly awarded as "best in class" in their industries (Wirtz and Zeithaml 2018).

Organisational Ambidexterity

An important enabler of a dual-culture strategy is organisational ambidexterity. Organisational ambidexterity refers to the company's ability to pursue goals with conflicting dimensions, for example flexibility versus efficiency (Raisch and Birkinshaw 2008). There are two types of organisational ambidexterity that are interconnected and particularly dominant in achieving a dual-culture strategy: (1) leadership ambidexterity and (2) contextual ambidexterity (Wirtz and Zeithaml 2018). Ambidextrous leadership entails that management fully endorses two seemingly conflicting strategies and leads by example. Management should also contextualise both strategies (i.e. both low cost and the customer satisfaction) by installing processes and encourage behaviours that operationalise this dual focus (Gibson and Birkinshaw 2004).

Leadership ambidexterity in a professional kitchen means that the chef is explicitly advocating saving costs wherever possible. In particular, focus is on activities that do not affect the customer interface and negatively influence the guest experience in any way. In fact, the chef simultaneously obsesses about guest satisfaction and equally invests in creating more value for the guests. Chef Davide Oldani has embraced this strategy in his star Restaurante D'O (Nobel and Tobin 2013; Wirtz and Zeithaml 2018). For example, one of the most important elements in the dining experience is the explanation of the dish. The chefs are the perfect ambassadors of their own creations, so in restaurant D'O, the waiters have been eliminated from the process and the chefs take on this role. This does not only improve the customer experience, but also eliminates part of the highest costs in a hospitality environment (i.e. personnel costs).

Contextual ambidexterity specifically relates to the chef's capacity to align and adapt contextual elements like systems, processes and beliefs for individual employees to be able to "exercise their own judgment in dealing with conflicting demands" (Wirtz and Zeithaml 2018, p. 68). This implies that conflicting goals should not only be embraced by management, but also by the individual employee. As Gibson and Birkinshaw (2004) point out, these goals should not be structurally separated in the organisation, but systematically embedded in such a way that individuals are supported and empowered to act in accordance with a dual strategy. Singapore Airlines for example has trained their cabin personnel to deviate from the standard food menu when needed and to prepare meals on the spot with ingredients available to accommodate unexpected requests from passengers (Heracleous and Wirtz 2014).

While it is easy for firms to ingrain service excellence as a focus with individual employees, asking them to be cost-effective at the same time is a harder sell. Indeed, while "zero-waste is the food world's latest favorite catchphrase, […] only a few restaurateurs are turning the trend into sustainable profits" (Parker 2018). Creating buy-in is more easily achieved when cost-efficiency measures target behaviour rather than cognitive appeals (e.g. information provision) only (Dolan et al. 2012). In particular, tapping into the choice architecture, that is the environment in which people make decisions, is proven to be more effective than solely relying on informational guidelines and rational decision-making (Lehner et al. 2016).

Towards Behavioural Change

Despite these insights, many food waste reduction measures still rely on cognitive mental models to change behaviour (e.g. Hollins 2013; Strotmann et al. 2017). Originating from standard economic models, this approach assumes that people read and analyse information. Based on the benefits or risk reduction presented (e.g. financial benefits of wasting less food), people consequently act in a certain way (Vlaev et al. 2016). This rational model presumes that behaviour is primarily guided by a reflective and effortful system of thinking (Thaler and Sunstein 2008).

However, the dual process theory introduced by the "originators" of the concept of nudging, Thaler and Sunstein (2008), explains that behaviour is not only guided by a reflective thinking system but also an automatic system. Fast, effortless and often unconscious, automatic thinking influences behaviour in the context in which it is taking place. Thus, altering the context where for example kitchen personnel act can lead to "changing behaviour without changing minds" (Dolan et al. 2010). Kahneman (2011) in his seminal text, "Thinking, fast and slow", refers to this as System 1 and System 2 of thinking. In this chapter, we align with Dolan and colleagues (2010) and refer to this as the context model and the cognitive model of behavioural change. Table 3.1 is adapted from these authors and provides a characterisation of these models along with illustrative food waste-related examples derived from Hollins (2013). Hollins (2013) specifically points out cognitive measures to be taken (Table 3.1) to reduce food waste out of which we have formulated examples of contextual food waste behaviours based on Dolan et al.'s (2010) definition of context-driven behaviours. For example, better menu planning is a cognitive exercise which can decrease food waste. However, such good intentions are only successful if more automatic and habit-driven behaviours like preparing the dish are also affected.

Table 3.1 Models of behavioural change

Model	Context model (System 1)	Cognitive model (System 2)
System characteristics	Automatic	Reflective
	Uncontrolled	Controlled
	Effortless	Effortful
	Emotional	Deductive
	Fast	Slow
	Unconscious	Self-Aware
Examples of use to reduce food waste	Preparing a dish	Menu planning
	Adjusting pace of working	Demand forecasting
		Procurement procedures
	Standard ordering	Food storage
	Accessing ingredients	Food preparation
	Cooking habits	Portion serving
	Plating by experience	

Source Adapted from Dolan et al. (2010), Hollins (2013)

As can be seen from the examples in Table 3.1, the cognitive model requires significant dedication and motivation to do things differently whereas the context model is more effortless and automatic. A good example of both the context model and cognitive model is Matt Orlando, chef and owner of Amass in Copenhagen, Denmark (Mowery 2017). He runs not only one of Copenhagen's most critically acclaimed dining places but Amass is also one of the world's few zero-waste restaurants. Orlando's leadership ambidexterity is pronounced in his obsession to reduce costs by treating products that others consider waste (e.g. vegetable tops) as resources. He has built a company culture where the most important food waste reduction measure is:

> The state of mind in which we work. It has become a sport in the kitchen, almost a competition, to see who can find the coolest way to up-cycle the by-products we are producing. When we look at a vegetable the first thing we ask ourselves is […] what trim will we produce and how can we process the trim from the carrot into something delicious? (Mowery 2017)

This is a good example of the context model where the prevailing social norms (i.e. state of mind and competition between employees to waste less food) guide employee behaviour (explained in more detail later in the chapter). However, the cognitive model is more dominant and precedes the context model here by careful deliberation, effort and skill in every stage, from menu planning to portion serving. As a result, Amass has reduced their food costs to 18% versus the industry average of 30–35% (Parker 2018). At the same time, Orlando is equally focused to provide an inventive and extraordinary dining experience that *New York Times* calls "a magnet for diners in the know" (Fabricant 2017). Contextual ambidexterity at Amass further allows the staff to explore different or new cooking processes like fermentation, drying and pickling. For example, in the fermentation room wine leftovers are turned into vinegar and various peels and trims are upcycled to become tastemakers rather than being discarded (Fabricant 2017; Mowery 2017). These and other methods, like "nose-to-tail" cooking where the entire animal is used for different purposes and for different dishes, have

generated important employee buy-in and allowed Orlando to create a dual-culture strategy and to achieve CESE. However, very few restaurants are able to achieve such a dedicated culture shift. For the majority of the market, the context model—relying on subtler and more unconscious cues to change behaviour—represents a more promising avenue to bridge good intentions of chefs to reduce food waste into actual behaviour. We suggest nudging as fruitful way to put the context model into action.

Nudging as a Vehicle for Behavioural Change

Much of human behaviours are automatic and intuitive. This explains why information provision, which requires deliberation and cognitive effort, is often not enough to change behaviour (Lehner et al. 2016). Nudging, on the other hand, primarily taps into the context model of behavioural change. It is a method that entails making deliberate changes in the choice environment which "nudge" people to both behave and make more responsible and pro-social choices. A nudge is any change in the environment that steers people's choices and behaviour in a predictable way without prohibiting available options or changing the economic incentives of the choice (Thaler and Sunstein 2008). As mentioned earlier, robust empirical evidence shows that nudges have bridged the attitude-behavioural gap in numerous contexts (e.g. Vlaev et al. 2016; Wilson et al. 2016). For example, when a nudge in the form of smaller plates is presented on a breakfast buffet, Kallbekken and Sælen (2013) demonstrate that consumers' general intention to waste less food is nudged into actual behaviour. Thus, by triggering consumers to serve themselves less than they can finish (by providing smaller receptacles) (Kallbekken and Sælen 2013) or installing trayless canteens to avoid stacking food (Thiagarajah and Getty 2013), the amount of food left on the plates and trays decreases significantly. These are two examples of nudges that particularly zoom in on making it easier for consumers to behave in a more pro-social way, but there are also many other types of nudges.

Some other important ones are, for example, default rules, use of social norms, disclosure and pre-commitment strategies (see Sunstein 2014 or Vlaev et al. 2016 for a complete list). In this study, we implemented two types of nudges that align with the concepts of leadership and contextual ambidexterity, namely a (1) social norms nudge and a (2) pre-commitment nudge. Social norms work as a "guide" for people to behave in a normatively correct and accepted manner as they conform to what others do (Goldstein et al. 2008). In the case of the social norms nudge, the leader of the group is utilised to establish the social norm. This enables leadership ambidexterity and in turn facilitates a CESE approach. To facilitate contextual ambidexterity, a pre-commitment nudge is used. This nudge requires the kitchen staff to pre-commit to a specific behaviour at a certain time in future. This slight "process" nudge (i.e. context) is expected to increase the likelihood of future compliance with the desired behaviour (Sunstein 2014).

Social Norms Nudge

Social norms are defined as "rules and standards that are understood by members of a group and that guide and/or constrain social behaviour without the force of law" (Cialdini and Trost 1998, p. 152). Using descriptive social norms as a nudge thereby entails providing informative cues about the normative behaviour and what others are doing to comply with that behaviour (Goldstein et al. 2008). Deviations from social norms have no legal consequences—it only impacts how a person feels about by not complying with the normative behaviour and how others react to the non-compliant behaviour (Cialdini and Trost 1998). Social norms develop through interactions with other people and can be both implicitly or explicitly stated (Cialdini and Goldstein 2004). Research further shows that social norms influence behaviour in both private (e.g. reusing the towel in a hotel room, see Goldstein et al. 2008) and public settings (e.g. revisiting the buffet, see Kallbekken and Sælen 2013). Abrahamse and Steg (2013) also find that social norms are particularly effective in an employee context. These settings allow for face-to-face interactions (where the social norms can be more explicitly

expressed) which, in comparison with only written messages, further reinforce the normatively accepted and expected behaviour (Abrahamse and Steg 2013). This is hence an important reason to include a social norms nudge in this research.

There are many examples of how social nudges influence more moderate food consumption (see, e.g., Cruwys et al. 2015 for a review) and stimulate various types of resource conservation behaviours in hotels (e.g. Chang et al. 2016; Nisa et al. 2017 for reviews). Goldstein and colleagues (2008) illustrate, in particular, that when consumers are informed about how others behaved in the very same setting that they are currently in (e.g. that the previous guests in a specific hotel room participated in a hotel water conservation programme by hanging up their towel), their conformation to the social norm increased further.

In a professional kitchen setting (the setting of our study), the "white" brigade is often a tightly knit team that closely works together. The social context is extremely important because well-functioning teams tend to rely not only on formal management but also on social structures (Sorgule 2016). Within that structure, the chef is central to the team. This hierarchy is not just defined by a structure, but also by skills, expertise and respect.

The chef is regarded as the artist of the trade. Complying with the chef's vision and behaviour is important in order to fit in and to belong to the team (Morse 2002). Similar to how consumers react to other consumers' behaviour in a specific context, reminding the staff in the kitchen what their chef is doing to reduce food waste is also expected to influence their actions to discard less and save more food. Research on social influence approaches supports this expectation by showing that "block leaders" and "modelling" are in fact the most effective forms of all social influence interventions (Abrahamse and Steg 2013). This entails that somebody from the same social network informs and "models" (showing by doing) the socially expected and accepted behaviour. In line with those research findings, we expect that implementing a social norms nudge using the chef and the community as role models will decrease the amount of food wasted by professional kitchen staff.

Pre-commitment Nudge

Most people procrastinate to make decisions and find it difficult to achieve even the simplest goals, such as dietary objectives or pro-social behaviours. Research shows that this can be changed significantly by pre-committing to a specific behaviour (e.g. Baca-Motes et al. 2012; Miller et al. 2016). Making a commitment generally entails that an individual pledges to comply with a specific viewpoint or behaviour (Abrahamse and Steg 2013). Sunstein (2014) further describes a pre-commitment nudge as strategy whereby "people commit to a certain type of action" (p. 5) and preferable at a precise future moment in time.

Commitments that are made public are usually more effective, but they do not need to be rewarded or penalty driven (Dolan et al. 2012). Indeed, publicly committed individuals are more likely to process information in accordance with their commitment. This means that they are likely to be influenced by information supporting their commitment and equally resistant to changes to their initial commitment (Abrahamse and Steg 2013). Even just signing a pre-commitment increases the probability that the goal will be achieved. Baca-Motes and colleagues (2012) show for example that hotel guests, who make a pre-commitment to behave in a sustainable manner during their stay (e.g. reusing the towel and switching off the light), comply significantly more with this behaviour than guests who did not make the same promise at check-in. This effect is triggered by an internal need to reduce cognitive dissonance between conflicting attitudes and beliefs from for example promising to do something and not following through later (Baca-Motes et al. 2012). It is a disharmonious state of mind driving people to restore consistency by balancing agreements with actual deeds (Cialdini 2007).

To further increase the conformity to the commitment, the commitment message should be specific (Locke and Latham 2002). Previous research shows that message specificity reduces "the ambiguity about what needs to be accomplished" (Baca-Motes et al. 2012, p. 1072). In a professional kitchen, waste can often be avoided by small and simple

measures that most staff are aware of but fail to comply with in the heat of running the operation (Staats 2018). This could be things like putting food back into the refrigerator even if there is only a small piece left, using the closest-to-expiry-date product first, creating daily specials from products that are about to be spoiled and creating transfer orders for food that can be used in other kitchens (for establishments operating several restaurants). These are just a few obvious measures, but unfortunately, they are often not complied with.

Thus, in the second restaurant kitchen of our experiment, we apply a pre-commitment nudge. In line with the importance of message specificity to avoid ambiguity, the information was particularly zoomed in on food waste reduction. We consequently expect that when the kitchen staff makes a specific commitment, it will reduce food waste significantly more than when there is no pre-commitment.

Research Methodology: Two Field Studies

To empirically test the social norms and pre-commitment nudge, we set up two field studies. The studies were executed concurrently from November 2017 to January 2018 and in two separate kitchens that operate discretely and independently of each other. Each kitchen is manned by separate kitchen brigades and serves different restaurant outlets located on a Hotel Management University campus in The Netherlands. The restaurants that the kitchens serve feature different concepts, cuisines, menus and target markets. The kitchen crews, the unit of analysis in the studies, consist of junior and senior students in both kitchens. Professional chefs, also referred to as instructors, manage the kitchen brigades. We measured the food waste in kilograms of organic waste which also includes unavoidable organic waste like peels and vegetable trims.

Both restaurants are open from Monday through Friday. This means that the kitchens operate 5 days per week. To understand the current waste levels, we first set up a baseline measurement for both studies. These ran for 3 weeks or more precisely, 15 consecutive working days. The immediate week after the baseline measure was not included as

it was not a representative week of operations due to the upcoming Christmas period. Therefore, the implementation of the intervention took place after the holidays. The nudge in each kitchen was operationalised for 9 (Study A) and 8 (Study B) consecutive working days. This was done to ensure that we had the same participants in the experiment as the staff rotates every 2 weeks for training purposes. The first week of the intervention was shorter because the restaurants only opened on Tuesday (Study A) and on Wednesday (Study B) after the holidays. This gave us 4 days of data in the first week for Study A and 3 days of data for Study B, respectively. In each kitchen, a different nudge was tested. Study A addresses the social norms nudge, whereas Study B investigates the effects of a pre-commitment nudge.

Study A: Social Norms Nudge

Procedure

The kitchen in Study A is dedicated to serve an upscale buffet restaurant (set up in different buffet stations) that is predominately frequented by staff and students. In this specific kitchen, large quantities of food are prepared simultaneously to make the buffet stations ready for service at a specific time. Thus, planning and preparation is key to reduce food waste as many inexperienced kitchen staff members tend to prepare too much for "just in case its busy" situations.

For the purpose of this nudge, the chefs were identified as important block leaders and role models for the kitchen brigade (Abrahamse and Steg 2013; Morse 2002). Aligning and conforming with the norms of the community is also important to fit in. As a result, we used both stakeholders as social reference points to develop the social norms nudge. We communicated this via signs throughout the kitchen. The signs clearly expressed the fact that the chefs find it very important not to waste food and that the community is doing what they can to reduce food waste. They also appealed to the staff's mindset with a prompt "Do you?" (see Fig. 3.1). Figure 3.1 further shows that we emphasised the

Fig. 3.1 Social norms nudges (Study A)

face-to-face social interaction in the nudges by adding the faces of the chefs and featuring a photo of the kitchen brigade community. The signs were featured in many different places throughout the kitchen.

We weighted the organic food waste on a daily basis to measure the influence of the nudge on food waste behaviour of the kitchen staff. This action did not provide an additional cue because the organic food waste is already separated in specific waste bins as part of standard

operations. The kitchen operates from Monday to Friday, resulting in 15 days of food waste data for the baseline measurement and in 9 days of operational data for the social norms intervention as the restaurant was closed on the Monday of the first week.

Analysis and Results

During the baseline measure, the average food waste was slightly more than 56 kilograms per day ($M_{\text{BASELINE\_SN}} = 56.18$, SD = 12.82). This decreased to an average of about 42 kilograms per day during the intervention of the social norms nudge ($M_{\text{NUDGE\_SN}} = 42.13$, SD = 17.36, see Fig. 3.2). This difference equals an average of 14.05 kilograms of food saved per day and an average decrease of food waste of 25.02% per day as a result of the social norms nudge implementation.

The results from an ANOVA further show that when not accounting for the days of the week, the social norms nudge had a statistically significant effect on the kitchen crews' efforts to reduce food waste ($F(1, 24) = 5.19$, $p = .033$) in comparison with when there was no

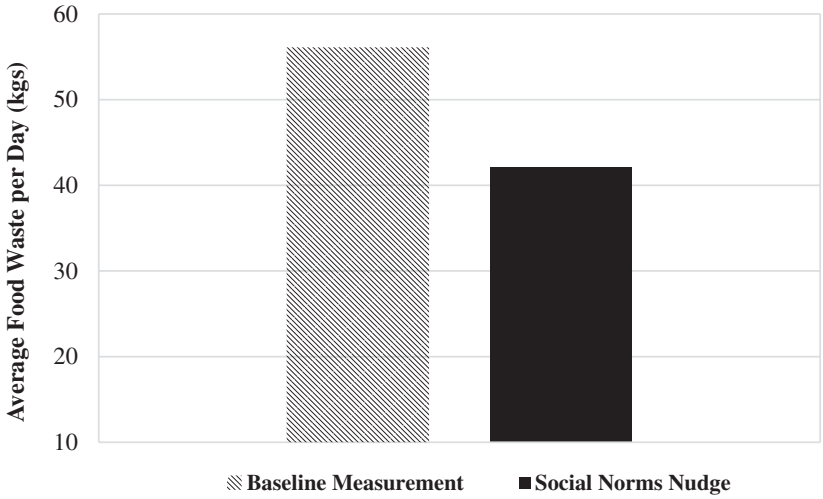

Fig. 3.2 Average food wasted per day during the experiment (Study A)

nudge implemented. When including the days of the week in the ANOVA, this effect becomes marginally significant ($F(1, 24) = 3.41$, $p = .086$). There is no direct effect of the days of the week ($F(4, 24) = 2.10$, $p = .135$) and also no interaction effect between the interventions and the days of the week ($F(4, 24) = 1.61$, $p = .228$). This means that there is no specific day of the week that on average produces significantly more waste than another and that the nudge does not influence this pattern. Yet Fig. 3.3 shows that there are quite large differences on average (in real numbers) between (1) the days of the week in terms of food waste generated in general and also between (2) the baseline measurement and the nudge period on the different days.

To fine-grain the results further, we see that particularly Mondays and Fridays produce a lot of food waste. As the kitchen is closed on Saturday and Sunday, there are two plausible explanations for this. Firstly, items that cannot be used the following week because of expiry

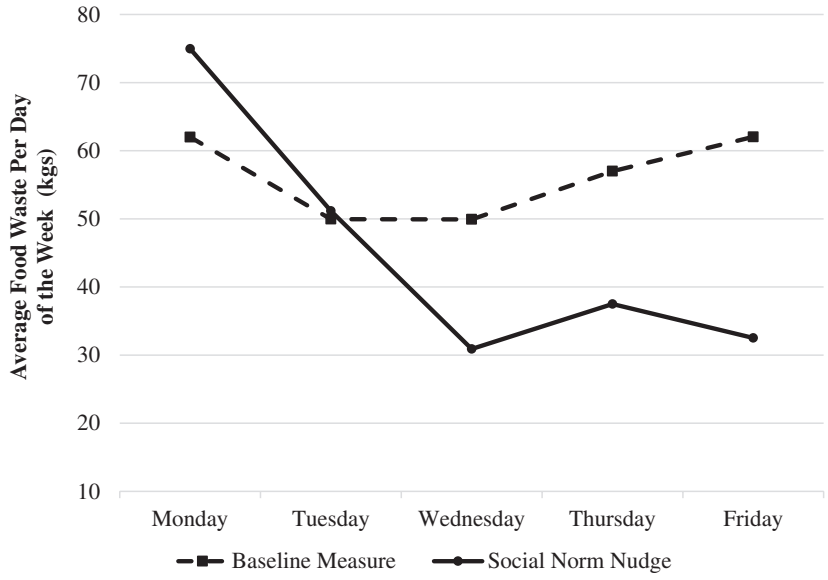

Fig. 3.3 Average food wasted per day of the week during the experiment (Study A)

dates and spoilage are discarded on Fridays. Secondly, Mondays are a day when the kitchen prepares for the upcoming week and precooks several items (e.g. stocks and soups). This produces more unavoidable food waste such as peels, core of vegetables and so forth. This can also explain why the social norms nudge is not as effective on Monday in the second week of the intervention. Another argument is that the crew needed to be reminded of the social norms again after the weekend. The result of the exposure to the nudges during Monday is visible on the following day (Tuesday in week 2) when the food waste drops significantly again. This is visualised in Fig. 3.4 which outlines the daily food waste per kilogram during the baseline measurement (first 3 weeks) and during the implementation of the social norms nudge (last 2 weeks starting Tuesday).

Study A shows that informing and reminding staff members of what their role models and community expect of them have a significant effect on their behaviour. Indeed, explicitly communicating what the social norms are in relation to food waste nudges the kitchen crew to conform to the socially acceptable behaviour.

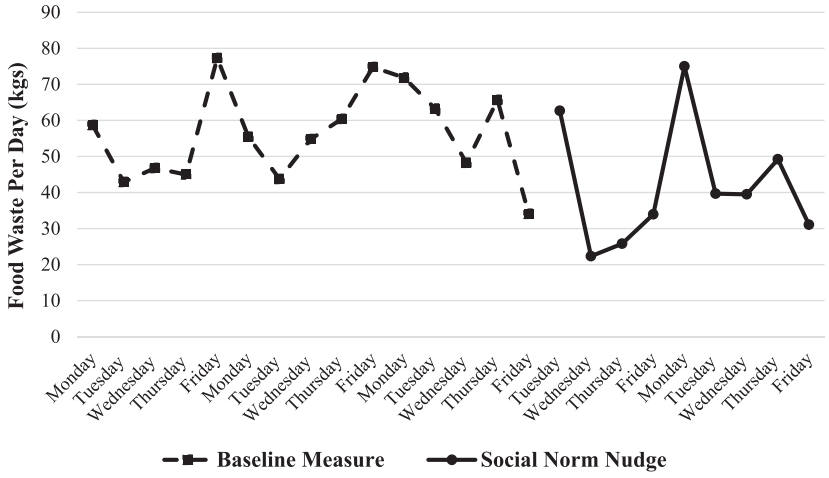

Fig. 3.4 Daily food wastage (Study A)

Study B: Pre-commitment Nudge

To further explore the effectiveness of nudging in a professional kitchen context, we set up Study B in a "wing" kitchen. This kitchen serves both a casual dining and a fine dining restaurant, both of which are predominately catering to external guests. In this study, we investigate the effect of a pre-commitment to prime participants to waste less food.

Procedure

Similar to and at the same time as Study A, we took a baseline measurement during 15 consecutive days. When the restaurants reopened and the kitchen was operational again on Wednesday after the Christmas period, we implemented the pre-commitment nudge for 8 days. The pre-commitment letter was handed out on Wednesday morning in the first week and Monday morning in the second week. To make the pre-commitment public, they were personally handed out and explained to the kitchen brigade (rather than emailed). Upon completion, the pre-commitments were given back to the research assistant. It was operationalised by asking the participants to answer a few questions about food waste followed by a commitment to do their best to prevent waste (see Fig. 3.5). The questions served as facilitators to make the message specific to food waste and to prime the participants to actively think and reflect (rather than passively read) on their own knowledge and attitude towards waste.

To subtly remind the crew to fulfil their commitment to minimise food waste during times of operation, we implemented green happy smileys on the refrigerators and sad red faces on the waste bins (see Fig. 3.6).

We chose the pre-commitment nudge and the reminding smileys for this kitchen because here the crew cooks to order and accommodate for many individual guest requests. This means that many food items are taken out and back in again to the refrigerators several times per night. In the heat of the moment, it is sometimes easier to leave the food product out or even to throw it away than to place it back into

COMMIT BY REDUCING FOOD WASTE

Hotelschool The Hague

Dear PE's,

Please read the following carefully and fill in your answers.

To what extent are you concerned of the negative consequences of food waste in the environment, economy and society?
o Not at all concerned
o Slightly concerned
o Somewhat concerned
o Moderately concerned
o Extremely concerned

Where do you think your food waste comes from? (Rank from 1 to 4, considering 1 for the most amount and 4 for the least amount)
__ Over-ordering
__ Food spoilage
__ During food preparation and cooking
__ During service (portioning and serving)

Why do we seperate food waste? (Multiple answers possible)
o It is legally required
o Protection of human health
o It reduces the environmental impact
o Cost saving
o Other, namely: _____

Which products should be thrown in the green bins and which products should be thrown in the grey bins?
Please write down the colours on the empty spots:
o Plastic: _____ bin
o Fruit: _____ bin
o Sauces: _____ bin
o Vegetables: _____ bin
o Paper roll: _____ bin
o Bones: _____ bin

What solutions for reducing food waste would you consider? (Multiple answers possible)
o Composting
o Donate to charity
o Software or application
o Staff/student meals
o Create a new dish with leftovers
o Other, namely: _____

What is your gender?
o Female
o Male

What is your nationality?
_____

Based on this information and the HTH efforts to reduce food waste, I will do my upmost best to reduce food waste by;
- using items that about to expire first.
- taking control of the inventory.
- thinking thoroughly of all the items I throw away in the bins.
- caring and paying attention to every product I prepare.
- controlling the portion sizes.
- labeling all the food items.
- motivating each other to work towards a greener sustainable environment.

Date: ____-____-_____

Signature: _____

Fig. 3.5 Pre-commitment nudge (Study B)

Fig. 3.6 Reminder smileys (Study B)

the refrigerator. In this kitchen, it is therefore important to nudge the right behaviours during the operation whereas in Study A, the largest difference could be made during the planning and preparation stage by reminding the crew what the social norm is.

We used the same measures as in Study A. We weighted the organic food waste in kilograms for 15 days before the experiment and for 8 days during the experiment.

Analysis and Results

The effect of the pre-commitment in combination with the green and red smileys was substantial. The average weekly food waste was close to 19 kilograms per day during the baseline measurement weeks ($M_{\text{BASELINE\_PC}} = 18.92$, SD = 5.69). The pre-commitment nudge and the smileys on the waste bins reduced this amount with more than 6 kilograms per day resulting in an average daily waste to slightly less than 13 kilograms per day ($M_{\text{NUDGE\_PC}} = 12.58$, SD = 4.71, see Fig. 3.7). This means that the intervention in this kitchen triggered the staff to save on average 33.50% more food every day. An ANOVA further shows that the differences in food waste between the baseline measurement and pre-commitment nudge are significant ($F(1, 23) = 7.24$, $p = .014$).

Further analysis showed that this main effect also is significant when accounting for the days of the week ($F(1, 23) = 7.80$, $p = .015$). There

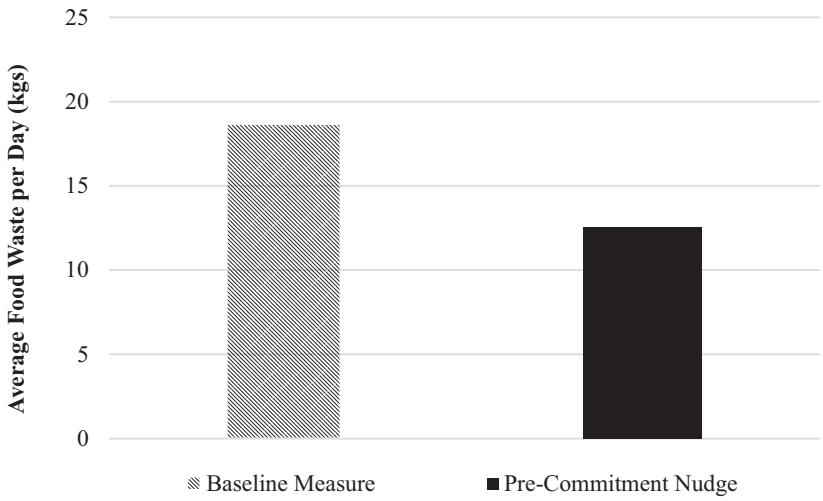

Fig. 3.7 Average food wasted per day during the experiment (Study B)

is no direct effect of the days of the week ($F(4, 23) = 1.62$, $p = .229$) and no interaction effect between the intervention and the days of operations on the food waste generated ($F(4, 23) = .07$, $p = .991$). This entails that on average, there is not a day of the week that produces significantly more (less) food waste than another and that regardless of the day of the week, the pre-commitment nudge is equally effective. Figure 3.8 outlines this pattern by showing the average food waste per day during the baseline measurement period and the pre-commitment intervention.

Consistent with the findings in Study A, additional investigation shows that a lot of food is wasted on Fridays in particular. For the same reasons as in Study A, this is because the restaurant and thus also the kitchen are not open on Saturday and Sunday. More food is therefore discarded on Fridays because of the inability to use it before it is either spoiled or expired. In contrast to Study A where it took a full operational day on Monday for the social norms nudge to have an effect, when reminded about the commitment to reduce food waste on Monday morning, it had a direct effect on staff behaviour. In line with operations of this kitchen where the procedure is to "cook-to-order",

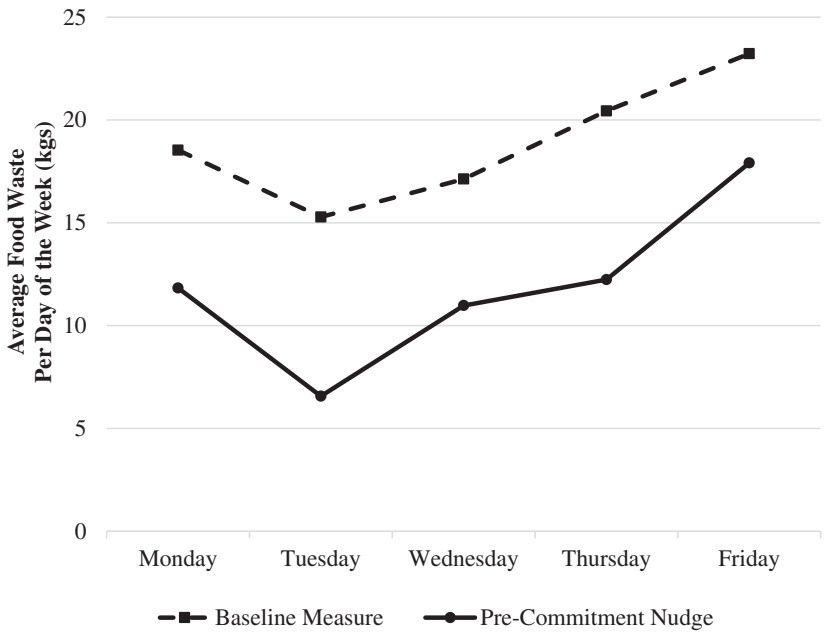

Fig. 3.8 Average food wasted per day of the week during the experiment (Study B)

less preparation and pre-cooking takes place at the beginning of the week. Consequently, there is less food waste on Mondays in this kitchen (also during the baseline measurement) in comparison with the buffet kitchen in Study A. Figure 3.9 displays this pattern by showing the daily food waste during the baseline measure (first 3 weeks) and then during the pre-commitment intervention period (last 2 weeks starting on Wednesday).

Positively surprised by these large effects of the nudges, we interviewed some of the kitchen crewmembers to find out how these savings on food waste had been realised. One of the junior crewmembers told us that they had made it into a competition of who could waste the least food. The chefs also informed us that the wing kitchen crew was very engaged in transferring food to the buffet kitchen that they could no longer use. This way the buffet restaurant could use it the next day for lunch rather than the wing kitchen having to throw it away.

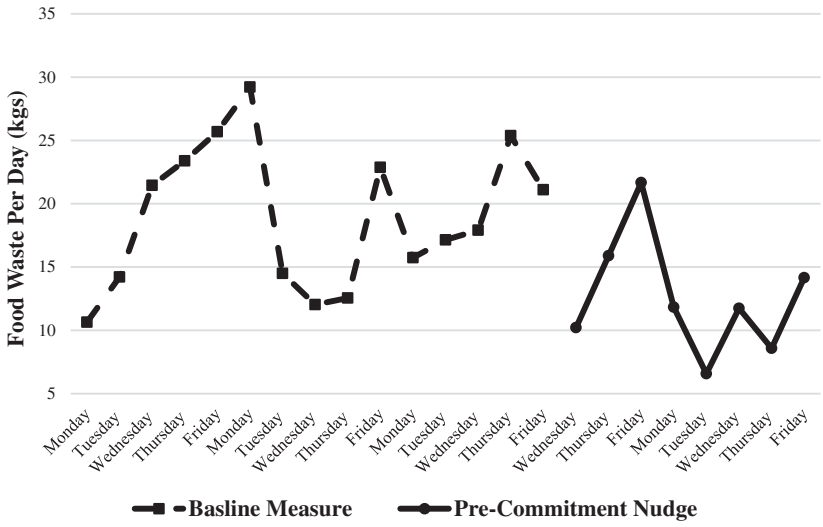

Fig. 3.9 Daily food wastage (Study B)

As a sign of the unconscious effect of nudging, some crewmembers could not clearly point out what had changed in their behaviour. One of the senior crewmembers supervising the younger kitchen crew said: "Maybe the commitments that were listed at the bottom of the questionnaire […] actually worked on their behaviour and they actually did their best to waste less food".

Another one told us that maybe it helped to think about saving food in a different way:

> During the morning meeting […] a few students commented after filling out the questions and having seen the waste tracking forms in the kitchen, if it could be used as their learning goal; reducing food waste by for example 5kgs.

These insights of not being able to specifically identify behavioural changes support the notion that nudging has the capacity to influence behaviour without consciously influencing the mind (Lehner et al. 2016). Whether it was unconscious or also conscious choices in some

instances, this research shows that inexpensive and easily implementable nudges can mobilise important behavioural changes to save food from the bin and thereby make a significant contribution both financially and environmentally to the operation of the restaurant.

General Discussion

The goal of this research was to investigate whether nudges could be used to strategically manage the workforce in professional kitchens to behave more sustainably, specifically in relation to food waste. Building on a CESE approach, we suggested that nudges can help to support leadership and contextual ambidexterity, both key ingredients to CESE. We demonstrate the effectiveness of different nudges substantially diminish food waste through two separate field experiments in two different, independent professional kitchens. Both the social norms and pre-commitment nudges resulted in significant savings. The nudges triggered the kitchen crew to act differently, in a manner that allowed employees the freedom to autonomously decide how to operate more cost-effectively. Our research therefore contributes to the emerging research on CESE and specifically to the development and implementation of a dual-culture strategy to realise CESE within firms. Saving 25.02% (Study A) and 33.50% (Study B) more food per day makes a significant difference to profitability. It is especially important to note that these types of cost-saving measures do not influence the guest experience in the restaurants. Hence, our research demonstrates that implementing a nudging strategy can help to create important employee buy-into act sustainably in an industry that is typically indoctrinated with a mindset that favours the customer experience at all costs. This further aligns with previous research outlining that staff awareness and communication about food waste engages employees to "walk the extra mile" to reduce the amount of food wasted (e.g. Filimonau and Delysia 2019).

We specifically show how nudging, due to its effortless, automatic and almost unconscious nature, can help employees in an effective way to deal with at first sight conflicting goals of cost reduction and

customer satisfaction. Interestingly, these effects also sustained during the period they were implemented. Nudging strategies are sometimes criticised for their potentially short-term effects (e.g. Bucher et al. 2016)—once people get used to them, they might become less effective. During the timeframe of our experiments, we did not observe such an effect. In fact, the pattern through time seems to suggest that the nudges were almost equally effective. Interestingly though, we did see that the reinforcement of the pre-commitment nudge seemed to have an uplifting effect. This may suggest that the mechanism of the nudge itself does not lose its effectiveness. Aligned with a recent large-scale study on household food waste (showing that repeated multi-channel communication is key to drive behavioural change; Young et al. 2017), it may however be important to reinforce the nudge through different communication formats for the nudges to sustain their effectiveness in the long run.

To further support our findings, future research can explore the effect of nudging on employee buy-in in a context where the kitchen staff has worked for many years and are more used to "the way we always do things around here". The kitchen crews in our sample were students and still in training, which means that they are typically willing to learn and open to change. For example, work experience might moderate the effect of the social norms as experienced staff has acquired its own expertise and might be less influenced by the chef's norms.

There is also a need to further explore the longitudinal effects of nudging in a food waste context. The interventions in this study were implemented for 9 and 8 days, respectively. Our results provide a first insight into how to activate change, but a better understanding of longer-term effects of the nudges is needed (Bucher et al. 2016). While we did not observe any significant wear-off effects during the investigated period, it is important to assess these effects over time. Indeed, research is needed to investigate if the same nudge (1) can continuously be effective, (2) needs to be communicated in different ways over time or (3) if the type of nudge used should be altered over time altogether (i.e. using a variety of different nudging strategies).

Finally, the current work investigated two nudges, social norms and pre-commitment. Whereas the results are significant, there are other

nudging techniques and combinations of different nudges that are interesting to explore. For example, people are guided by easy and convenient solutions (Sunstein 2014). In the kitchen, the waste bins are often closer by than the refrigerators. It would be interesting to explore the effect of placing the waste bins further way or making it more convenient and easier to place food back into the refrigerator by for example having a mobile refrigerator closer by while cooking. Specifically, for the pre-commitment nudge it would be interesting to explore the spillover effects of this intervention as our post-experiment interviews revealed that other social factors might have been put in motion by this nudge (e.g. a competition to waste less food).

Conclusion

This chapter contributes to the scarce literature on the effectiveness of nudging in a real-life employee context. In doing so, we pave an interesting way forward for restaurants and other food service providers to explore in their search for CESE and competitive advantage. Through nudging, we show how cost reduction measures can be achieved in the form of reducing food waste, a cost measure that not only has significant financial but also vital environmental and societal implications. Most notably, this research demonstrates that an important solution in the battle against food waste is to change the choice architecture for employees in professional kitchens. Rather than solely focusing on information provision requiring cognitive effort and reflection, nudging cues about social norms and frames to prime consistent behaviour can work as an invisible hand in making better employee decisions for the company and for society at large.

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